CLAIMS

1. A signal processing device for reproducing recorded information on an information recording medium, comprising:

a feedback loop including operational amplifier means for amplifying a reproduction signal of the recorded information and a gain/offset control means for controlling a gain and an offset of the operational amplifier means so that each of an amplitude and an offset of an output of the operational amplifier means becomes a predetermined value, respectively; and

direct-current component extraction means for extracting direct-current component information of the reproduction signal from signals of the feedback loop,

wherein the signal processing device supplies the direct-current component information as information indicating an asymmetry amount of the reproduction signal.

2. The signal processing device of claim 1, wherein the direct-current component extraction means is binarization means for receiving the output of the operational amplifier means as an input and performing binarization while adjusting a slice level by feedback control so that a duty ratio after the binarization becomes a predetermined value.

3. The signal processing device of claim 1, wherein the direct-current component extraction means is a low pass filter for receiving the output of the operational amplifier means.

4. The signal processing device of claim 3, wherein a cutoff frequency of the low pass filter is set to be lower than a frequency obtained from a reciprocal of a maximum inverse period determined by a modulation rule of the reproduction signal.

5. The signal processing device of claim 1, wherein when an input reproduction signal of the operational amplifier means is a signal from which a direct-current component has been removed beforehand, offset control information from the gain/offset control means to the operational amplifier means is supplied as information indicating the asymmetry amount.

6. The signal processing device of claim 1, further comprising waveform detection means for detecting, based on the output of the operational amplifier means, information for a waveform of the reproduction signal and supplying the waveform information to the gain/offset control means.

7. The signal processing device of claim 6, wherein the waveform detection means includes:

peak detection means for receiving the output of the operational amplifier means as an input and performing peak detection; and

bottom detection means for receiving the output of the operational amplifier means as an input and performing bottom detection.

8. The signal processing device of claim 6, wherein the waveform detection means includes:

amplitude detection means for receiving the output of the operational amplifier means as an input, detecting an amplitude of the reproduction signal and outputting an amplitude information signal; and

offset detection means for receiving the output of the operational amplifier means

as an input, detecting an offset of the reproduction signal and outputting an offset information signal.

9. The signal processing device of claim 6, wherein the waveform detection means includes:

peak detection means for receiving the output of the operational amplifier means and performing peak detection;

bottom detection means for receiving the output of the operational amplifier means and performing bottom detection;

amplitude detection means for receiving an output of the peak detection means and an output of the bottom detection means as inputs, performing an operation to obtain an output signal amplitude of the operational amplifier means and outputting an amplitude information signal; and

offset detection means for receiving the output of the peak detection means and the output of the bottom detection means as inputs, performing an operation to obtain an output signal offset of the operational amplifier means and outputting an offset information signal.

10. The signal processing device of claim 1, further comprising equalizer means, located between the operational amplifier means and the gain/offset control means, for emphasizing a high frequency band of the output of the operational amplifier means.

11. The signal processing device of claim 10, further comprising equalizer contol means for controlling an emphasis amount of the high frequency band of the equalizer means,

wherein the emphasis amount of the high frequency band of the equalizer means is adjusted, based on the information for the asymmetry amount, so that a reproduction error rate is reduced.

12. The signal processing device of claim 11, wherein the emphasis amount of the high frequency band of the equalizer means when the asymmetry amount is larger than a predetermined value is set to be smaller than that when the asymmetry amount is smaller than a predetermined value.

13. The signal processing device of claim 1, further comprising:

defect detection means for detecting a defect of the reproduction signal; and

holding means for holding the direct-current component information during a defect detection period.

14. The signal processing device of claim 2, further comprising smoothing means for smoothing a slice level of the binarization means,

wherein an output of the smoothing means is supplied as information indicating the asymmetry amount of the reproduction signal.

15. The signal processing device of claim 14, wherein the smoothing means includes an integrator or an accumulator for receiving the slice level of the binarization means.

16. The signal processing device of claim 14, further comprising defect detection means for detecting a defect of the reproduction signal,

wherein integration processing of the smoothing means is stopped or initialized during a defect detection period.

17. The signal processing device of claim 1, further comprising:

data slice means for binarizing the reproduction signal of the recorded information; and

slice level control means for controlling a binary slice level of the data slice means,

wherein adjustment is made, based on the information for the asymmetry, by applying an offset to the binary slice level of the data slice means so that a reproduction error rate is reduced.

18. The signal processing device of claim 2, further comprising an AD conversion means, located between the operational amplifier means and the gain/offset control means, for sampling the output of the operational amplifier means and then performing analog-to-digital conversion to the output of the operational amplifier means,

wherein the binarization means receives sampling data provided by the AD conversion means as an input.

19. The signal processing device of claim 18, further comprising:

Viterbi decoding means for outputting decoded data corresponding to a state transition maximum-likelihood-estimated by Viterbi decoding of the sampling data; and

judgment level control means for controlling, based on the asymmetry amount information, a judgment level of the Viterbi decoding means so that a reproduction error rate is reduced.

20. The signal processing device of claim 18, further comprising:

Viterbi decoding means for outputting decoded data corresponding to a state transition maximum-likelihood-estimated by Viterbi decoding of the sampling data; and

data output control means for selectively outputting, based on the asymmetry amount information, either one of the output of the binarization means or an output of the Viterbi decoding means so that a reproduction error rate is reduced.

21. The signal processing device of claim 20, wherein the data output control means selects the output of the Viterbi decoding means when the asymmetry amount is smaller than a predetermined value and selects the output of the binarization means when the asymmetry amount is equal to or larger than the predetermined value.

22. A signal processing method for reproducing recorded information on an information recording medium, comprising the steps of:

controlling a gain and an offset of an operational amplifier means for amplifying a reproduction signal of the recorded information in a feedback loop so that an amplitude and an offset of an output of the operational amplifier means are set at a predetermined value, respectively;

extracting a direct-current component information of the reproduction signal from signals of the feedback loop; and

supplying the direct-current component information as information indicating an asymmetry amount of the reproduction signal.